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(71) Applicant: KIMBERLY-CLARK CORPORATION
401 North Lake Street
Neenah ,Wisconsin 54956-0349(US)

(72) Inventor: Strack, David C.
Route 6, Fox Place
Canton, GA 30114(US)
Inventor: Shultz, Jay S.
550 Woodline Court
Roswell, GA, 30076(US)

(74) Representative: Diehl, Hermann Dr. et al
Diehl & Glaeser, Hiltl & Partner
Flüggenstrasse 13
W-8000 München 19(DE)

(54) Laminate material having stretch and recovery process for forming and use of same.

(57) Laminate materials (6) are constituted by at least a textile web (1) (a web of knitted, woven or scrim material) and a nonwoven elastomeric web (2) preferably a web of meltblown elastomeric fibers, bonded together. Bonding is performed with the elastomeric web (2) in an unstretched or only partially stretched state, so that the textile web is flat (non-gathered) when the elastomeric web is in its unstretched state. The laminate material (6) has recovery and barrier (opacity, insulation, wind resistance, etc.) properties, while retaining breathability, due to the nonwoven elastomeric web. The laminate material can be used for wearing apparel and fitted pads (table pads, mattress pad, etc.). Also disclosed are methods of forming the laminate materials and special uses of same.

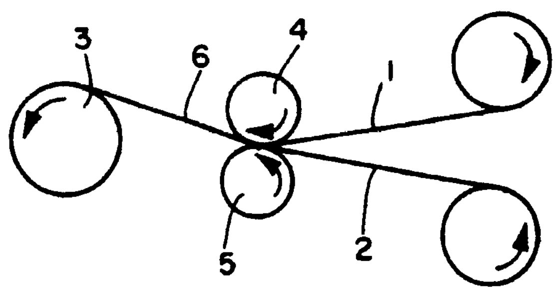

FIG. 1

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The present invention is concerned with a laminate material having stretch and recovery, a method of making such laminate material and articles made therefrom.

Various textile materials, such as knits and woven materials, can be stretched, but have relatively poor recovery (that is, do not recover their original size and shape after stretching). Since there is not much retraction force in the recovery, these fabrics (e.g., knitted fabrics) tend to lose their original size and shape.

It has been desired to provide a textile material which is not only stretchable, but also has recovery characteristics. It is also desired to achieve such material which is stretchable and has recovery characteristics, as well as having other properties (such as breathability, puncture resistance, etc.) which permit the material to be used for making protective covering pads and wearing apparel. It is further desired to provide such material, having stretch and recovery characteristics, wherein in the unstretched state the material is not puckered (that is, does not have gathered portions; i.e., that is flat).

Elastic textile fabrics have previously been provided. Thus, U.S. Patent No. 2,184,772 to Vamos discloses an elastic textile fabric, having a limited stretch and recovery, utilizing textile material in which the weft threads are formed of elastic yarn. The elastic weft threads return the material to its original dimensions after it has been stretched. This patent further discloses a laminated textile material including a layer of elastic textile fabric as discussed above, a layer of biased textile fabric and an intermediate layer of elastic or rubber cement by which the two outer layers are laminated. This patent discloses that since the elastic textile fabric is cemented to the biased fabric by an elastic cement, the laminated fabric will return to its original size and shape after its stretching, due to the elasticity of the elastic textile fabric.

While this patent discloses a textile fabric having recovery characteristics due to use of an elastic fabric, the disclosed elastic fabric is another textile material, engineered using elastic yarns. These materials do not provide lightweight capabilities, and also cause problems in connection with processing, these elastic yarns being very difficult to process on knitting and weaving equipment due to their stretchiness and relatively high coefficient of friction.

U.S. Patent No. 3,497,415 to Adachi discloses a composite fabric in which a first knitted acrylonitrile fabric having two faces and being of relatively high elasticity is bonded to a second fabric which is a knitted rayon fabric also having two faces but having relatively no elasticity, the bonding being by means of an adhesive.

While disclosing a stretch knit material, problems also arise with the structure disclosed in U.S. Patent No. 3,497,415, in connection with providing a lightweight product and in processing of the knit, relatively high elasticity fabric.

U.S. Patent No. 3,904,455 to Goldman teaches a laminated fabric including a woven or knitted web of textile fibers reinforced by a backing directly united thereto, of a spunbond nonwoven web. This patent discloses that the knitted or woven fabric can have pattern effects desirable in upholstery fabrics; and that the spunbond nonwoven web can be formed of a material such as styrene, butadiene, polyisoprene, natural rubber, butadiene acrylonitrile, acrylic, vinyl chloride, vinyl acetate, vinyl alcohol, polyurethane, and polyester, among other materials.

This U.S. Patent No. 3,904,455 is directed to textile nonwoven laminations; however, stretch recovery is not an objective, nor does this patent focus on elastomeric materials for the spunbond nonwoven web.

U.S. Patent No. 4,438,172 to Katsutoshi, et al., discloses a heat retaining sheet, useful for batting or interlining in, e.g., clothing, the sheet consisting of webs in which fibers containing polybutylene terephthalate as at least one of the components and having a substantially unstretched definite fiber length are mutually bonded, the area shrinkage when treated with boiling water being up to about 20%. This patent further discloses an elastic heat retaining sheet which is soft and rich in flexibility, and has a high stretch recovery ratio. The elastic heat retaining sheet includes a nonwoven web which is formed by forming thin webs of elastic fibers independent of, and separate from, one another, the elastic fibers consisting of a polyether ester type copolymer containing at least polybutylene terephthalate as a hard segment and having a substantially undrawn definite fiber length; with the thin webs being layered like scales to form the nonwoven web. This patent goes on to state that the nonwoven web can be bonded to a woven fabric by a low-melting powder.

Japanese patent document 62-121,045 discloses a stretchable garment material for sportswear, including polyurethane elastic nonwoven and knit fabrics and polyurethane elastic film integrated with an intermediate fabric layer. As a specific example, the polyurethane elastic nonwoven fabric is press-laminated with a knit fabric, with the polyurethane film being laminated with an adhesive on the knit fabric surface.

Japanese Patent document No. 59-223347 discloses polyurethane elastic fibrous nonwoven cloth and methods of preparing such cloth. In one specific example, it is disclosed that the polyurethane is manufactured into an elastic web by using a molten blow spinning device having injection slits for hot gas at

both sides of extrusion nozzles for the polymer. After forming fine-form filaments using the molten blow spinning device, the filaments are collected on a conveyor and taken down between rollers to produce a nonwoven cloth; this nonwoven cloth showed lamination of open monofilaments of polyurethane elastic fiber, with the intersecting points among filaments being joined by melt adhesion. This patent document further discloses that the nonwoven cloth made of polyurethane elastic fibers, as disclosed in the document, may be utilized as it is, but also can be used in combination with other materials, including woven goods, mesh, nonwoven cloth, or web made of inelastic polymers, for example, synthetic fibers, such as polyester, nylon, polyolefin, acryl or woven goods from natural fibers, such as cellulose or wool.

While disclosing nonwoven polyurethane elastomeric webs, formed, e.g., using a molten blow spinning device, and also disclosing combinations of nonwoven polyurethane elastic webs with woven material, this patent document does not teach formation of textile articles wherein the, e.g., knit or woven web is flat (non-gathered). Moreover, this patent document does not focus on providing knit, woven or scrim webs having good stretch and recovery characteristics.

Notwithstanding all of the structures disclosed in the foregoing, it is still desired to provide a textile article having good stretch and high recovery characteristics, with one of the faces of the material being of a knit, woven or scrim, the face being flat (non-gathered) and having other characteristics such as breathability, water repellency and puncture resistance.

U.S. Patent No. 4,720,415 to Vander Wielen, et al., the contents of which are incorporated herein by reference in their entirety, discloses a composite elastic material of a gatherable web joined to at least one elastic web at spaced-apart locations, in which the gatherable web is gathered (e.g., puckered or non-flat) between the spaced-apart locations when the composite elastic material is in an unstretched condition.

U.S. Patent No. 4,801,482 to Goggans, et al., the contents of which, including the definitions therein, are incorporated herein in their entirety by reference, discloses an elastic pad which is elastic in at least one direction, the pad being a composite including an elastic nonwoven web and at least one nonelastic web joined to the elastic nonwoven web, with the nonelastic web being gathered between areas in which the nonelastic web is bonded (joined) to the elastic nonwoven web.

U.S. Patent No. 4,720,415 discloses composite elastic materials having stretch and recovery characteristics. However, the disclosed materials do not have a flat textile web when stretching of the elastic web is terminated. Rather, the disclosed materials have gathers in the gatherable web when the elastic web is not subjected to stretching. Similarly, the various products (including mattress pads and table pads) disclosed in U.S. Patent No. 4,801,482 include a composite having a gathered web upon release of stretching of the elastic web; specifically, the patent discloses a bulky laminate.

Thus, there still remains a need to provide a textile material having stretch and good recovery characteristics, yet which provides a flat surface, and has other desirable properties such as breathability, opacity, puncture resistance, etc.

This object is solved by the laminate material of independent claims 1, the process for making same according to independent claim 27, and the use of such laminate material according to independent claims 41. Further features and aspects of the present invention will become evident from the dependent claims, the description, examples and drawings. The claims are intended to be understood as a first non-limiting approach of defining the invention in general terms. The invention provides laminate material having stretch and recovery process for forming and use of same, and it is directed to a laminate material of (1) a first web of, for example, a knit, woven, or scrim material (that is, a textile material), together with (2) a nonwoven elastomeric web, to provide a laminate with stretch and recovery; a method of making such laminate, and articles made therefrom.

Accordingly, it is an aspect of the present invention to provide a textile material, having a knit, woven or scrim web and having stretch and recovery characteristics in all directions (limited, of course, by the inherent stretch limits of the starting textile material), which textile material is flat, and a method of making such textile material.

It is a further aspect of the present invention to provide a textile material having a knit or woven web, and having stretch and recovery characteristics, but without the need to include elastomeric yarn in the knit or woven structure, and without the need for elastomeric films.

It is a still further aspect of the present invention to provide a textile material having a knit or woven web, and with good barrier properties including puncture resistance, insulation, filtration, opacity and liquid repellency.

It is a still further aspect of the present invention to provide fitted pads, such as table pads and mattress pads, and upholstery, made of a textile material including a knit, woven or scrim web, the pads having stretch and recovery characteristics, which pads can protect the underlying article from dirt infiltration and is opaque, while being breathable to avoid condensation beneath the pad or upholstery.

It is a still further aspect of the present invention to provide wearing apparel including a knit, woven or scrim web, having stretch and recovery characteristics, which has thermal insulation properties and a dirt barrier, and has opacity, which wearing apparel has breathability.

In order to achieve one or more of the foregoing aspects the present invention provides a laminate of (1) a first web of a knit, woven or scrim material, and (2) a nonwoven elastomeric web, with the first web, when the nonwoven elastomeric web is in an unstretched state, being flat (that is, the first web is non-gathered or non-puckered).

In stating that the first web is flat after lamination, we mean that the knit web, woven web or scrim web, as part of the lamination, is not gathered when the nonwoven elastomeric web is unstretched, after the bonding has been performed. The gathering of a web attached to a nonwoven elastomeric web is described in U.S. Patent No. 4,720,415, the contents of which have been incorporated herein by reference in their entirety. Thus, the present product differs substantially from that in U.S. Patent No. 4,720,415.

According to the present invention, after bonding the laminate material can be stretched as much as the knit, woven or scrim web can be stretched, with the nonwoven elastomeric web providing power recovery (retraction force) upon relaxation of the stretching of the laminate.

The laminate according to the present invention includes at least two webs, (that is, two webs or more than two webs can be included). If more than two webs are used, the nonwoven elastomeric web can be an inner web of a sandwich of three webs, with the two outer webs, for example, being knit or woven or scrim webs. In this instance, the elastomeric web would be buried.

On the other hand, the elastomeric web can be exposed in the laminate material.

The nonwoven elastomeric web can be, for example, a spunbond web or a web of meltblown fibers. Desirably, the nonwoven elastomeric web is made of meltblown elastomeric fibers. Various known materials for forming meltblown elastomeric fibers, such a copolyetheresters; copolymers of ethylene and at least one vinyl monomer (e.g., ethylene vinyl acetate); A-B-A' block copolymers, wherein A and A' may be the same or different end blocks and each is a thermoplastic polymer end block or segment which contains a styrenic moiety such as polystyrene or polystyrene homologs, and B is an elastomeric polymer midblock or segment, segmented block copolymers, of two alternating segments, having the formula A-B (e.g., block copolymers having alternating segments of polyamide and polyether block copolymers commercially available from ATOCHEM Polymers of Glen Rock, N.J., under the trade name PEBAX); and a urethane polymer (e.g., polyurethane or a urethane copolymer), can be used in the present invention for the nonwoven elastomeric web. These specific elastomeric materials are only illustrative, and not limiting. As to various elastomeric polymers which can be utilized, and, moreover, techniques for forming meltblown elastomeric fibers and nonwoven webs of these meltblown fibers, attention is directed to the specific meltblown materials described in U.S. Patent No. 4,720,415 and No. 4,801,482 (the contents of each of which have previously been incorporated herein by reference in their entirety); and U.S. Patent No. 4,707,398 to Boggs and No. 4,741,949 to Morman, et al., the contents of each of which are incorporated herein by reference in their entirety. Various other elastomeric materials have been formed into meltblown elastomeric webs, and each falls within the contemplation of nonwoven elastomeric webs for the present invention.

The nonwoven elastomeric web, useful in the present invention, may be an unbonded or bonded material. Specifically, bonding of the nonwoven elastomeric material can enhance abrasion resistance; such bonding can be achieved thermally, for example. Illustratively (but not limiting), the nonwoven elastomeric web can be thermally point bonded.

Stretch recovery of the nonwoven elastomeric web is important in connection with the present invention, since the degree of recovery of the nonwoven elastomeric web will control the degree of recovery in the laminate (the stretch of the laminate being controlled by the degree of stretch of the knit or woven or scrim web of the laminate).

It is desirable that the nonwoven elastomeric web have omni-directional stretch and recovery, so as to delivery power recovery to whatever cloth is used. Thus, utilizing a nonwoven elastomeric web having omni-directional stretch and recovery, if the knit web of the laminate stretches in the machine direction (MD) then the laminate will have power recovery in the MD. If the knit web stretches in all directions, then the laminate will have power recovery in all directions.

A unique aspect of woven materials is that they stretch mostly in the bias (e.g., 45° off the machine direction (MD) or cross direction (CD). Using a nonwoven elastomeric web having omni-directional stretch and recovery, recovery is also provided in the bias direction.

As indicated previously, the nonwoven elastomeric web can be joined (bonded) to a knit web, or a woven web or scrim web, e.g., a nonelastic textile web, according to the present invention. These knit webs, woven webs and scrim webs are known in the art; conventional webs (textile webs, such as a nonelastic

textile web) can be used for the present invention. These knit webs, woven webs and scrim webs can be formed as done conventionally.

Knitted fabrics generally have good stretch but relatively poor recovery. Since there is not much retraction force in the recovery, these knitted fabrics tend to lose their shape. However, a laminate according to the present invention, utilizing a nonwoven elastomeric web as discussed above, imparts recovery to the knit. In addition, particularly when utilizing an elastic meltblown for the nonwoven elastomeric web, the laminate material has unique z- direction impact and puncture resistance. Moreover, by using the nonwoven elastomeric web, the durability of the knit fabric is enhanced because the yarns are locked onto the elastomeric surface (e.g., elastomeric meltblown surface) and are not subject to the same level of yarn-to-yarn abrasion and stresses that the free knit structure would experience. In addition, knits backed or laminated with the nonwoven elastomeric web (e.g., an elastomeric meltblown web) become snag and run resistant because the yarns are immobilized on the elastomeric meltblown surface. Thus, the use of the nonwoven elastomeric web, particularly an elastomeric meltblown web, provides power recovery to prevent bagging and sagging; provides puncture resistance, particle filtration and liquid penetration resistance; and also provides an anti-skid (relatively high friction) surface.

The foregoing characteristics of the laminate material are particularly desirable upon using the laminate material as a cover (e.g., a protective cover, such as a slipcover or fitted pad. In particular, having a knit facing outside during use, a fashionable fabric with good surface wear abrasion resistance is realized. Furthermore, the cover is kept in place due to the relatively high friction surface of the elastomeric member.

In addition to use of a knit web in combination with the nonwoven elastomeric web, according to the present invention, a woven or scrim web can be used. While woven and scrim webs have more dimensional stability than knits, especially in the machine and cross direction, power recovery is added to these materials to the extent that they stretch. Of particular interest is the bias stretch of, e.g., woven webs. The laminate of the present invention, using a nonwoven elastomeric web together with the woven web, provides a stretch recovery in the bias.

As with knits, the woven or laid scrim yarns are stabilized in their original structure, reducing yarn against yarn wearing, when the woven or scrim webs are laminated with the nonwoven elastomeric web according to the present invention. Stabilization of laid scrim webs is particularly useful, since the nonwoven scrims have poor dimensional stability to begin with. As with knit laminates, the z-directional puncture and impact resistance of the woven and scrim laminate is improved in the structure of the present invention, as compared with using a woven or scrim web by itself.

The nonwoven elastomeric web can be laminated to the web of knit, woven or scrim material by various known means. The most important factor is that the nonwoven elastomeric web be unstretched during lamination; or, alternatively, that any stretching of the nonwoven elastomeric web during bonding be sufficiently little such that when the nonwoven elastomeric web is relaxed to its unstretched state after bonding, there is no gathering or puckering of the, e.g., knit web.

Various means for bonding an elastomeric web to another web are disclosed, for example, in U.S. Patent No. 4,720,415, the contents of which have previously been incorporated herein by reference in their entirety. While the techniques for laminating the webs in this U.S. Patent No. 4,720,415 are applicable to the present invention, bonding according to the present invention is performed without substantial stretching of the nonwoven elastomeric web or other steps to create gathers or puckers (e.g., a non-flat surface) in the laminate.

The laminate textile material according to the present invention has various uses, including for wearing apparel and as coverings for various articles (e.g., table pads, mattress pads, upholstery (including slip covers), etc.). Moreover, the laminate materials according to the present invention can be useful as fabric design coordinates with stretch-bonded laminate fabrics, in apparel and other applications.

Accordingly, the objectives as discussed above are achieved by the present invention. Specifically, the present laminate textile materials have power recovery in all directions, although the degree of stretch is limited by the inherent stretch of the starting textile (knit or woven or scrim). Furthermore, the nonwoven elastomeric web component (particularly when such component is a web of meltblown elastomeric fibers) tightens the textile structure providing barrier properties and closing holes between the yarns of the, e.g., woven or knit web. These barrier properties include puncture resistance, insulation, filtration, opacity and liquid repellency.

Moreover, according to the present invention the elastomeric component may be buried in the textile structure (e.g., sandwiched between two webs of textile material such as knit material), whereby any undesirable feel of the elastomeric component may be avoided by a simple processing technique. In this regard, with conventional structures, using, e.g., spandex yarns, an expensive core wrapping procedure is performed to overcome the poor coverage and tactile aesthetics of such yarn; such core wrapping

procedure is unnecessary in the present invention.

In addition, the present invention can provide a textile material having stretch and recovery characteristics, as well as other properties as discussed above, in a relatively simple and inexpensive procedure. Such procedure according to the invention is clearly preferable to the present technique for forming textile fabrics, incorporated spandex or rubber yarns into the knitted or woven structure; such spandex or rubber yarns are very difficult to process on knitting and weaving equipment due to their stretchiness and relatively high coefficient of friction, and relatively high costs of equipment set-up.

Fig. 1 schematically illustrates the formation of a two-web laminate according to the present invention.

Fig. 2 schematically illustrates a first embodiment of forming a three-web laminate according to the present invention.

Fig. 3 schematically illustrates a second embodiment for forming a three-web laminate according to the present invention.

Fig. 4 schematically illustrates formation of a five-web laminate according to the present invention.

While the invention will be described in connection with specific and preferred embodiments, it will be understood that it is not intended to limit the invention to those embodiments. To the contrary, it is intended to cover all alterations, modifications and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims.

The present invention contemplates a laminate material including a textile web (e.g., a nonelastic textile web, such as a web of knit material, or woven material, or scrim), having stretch and recovery characteristics, achieved by laminating the textile web to a nonwoven elastomeric web (desirably, a web of elastomeric meltblown fibers). The laminated structure is flat (i.e., non-gathered) by joining (bonding) the textile web and nonwoven elastomeric web with the nonwoven elastomeric web in a non-stretched state (or so little stretched that, upon relaxation of the stretch, the textile material does not gather).

As set forth previously, the nonwoven elastomeric material is desirably a meltblown material. The fibers in the nonwoven elastomeric web illustratively range from 0.5 to 100 μm in diameter. However, if barrier properties are important in the finished laminate (for example, it is important that the final laminate material have increased opacity and/or insulation and/or dirt protection and/or liquid repellency) then finer fibers, in the 0.5-20 micron range, are preferred.

The nonwoven elastomeric web may be a nonwoven elastomeric composite web. Illustratively, such composite web can be made of a mixture of two or more different fibers or a mixture of fibers and particulates. Such mixtures may be formed by adding fibers and/or particulates to the gas stream in which elastomeric meltblown fibers are carried so that an intimate entangled commingling of the elastomeric meltblown fibers and other materials occurs prior to collection of the meltblown fibers upon a collection device to form a coherent web of randomly dispersed meltblown fibers and other materials, such as disclosed in U.S. Patent Nos. 4,100,324 and 4,803,117, the contents of each of which are incorporated herein by reference in their entirety. Useful materials which may be used in such nonwoven elastomeric composite webs include, for example, wood pulp fibers, staple length fibers from natural and synthetic sources (e.g., cotton, wool, asbestos, rayon, polyester, polyamide and the like), non-elastic meltblown fibers, and particulates such as, for example, activated carbon particulates or hydrocolloid (hydrogel) particulates commonly referred to as superabsorbents. Other types of nonwoven elastomeric composite webs may be used. For example, a hydraulically entangled nonwoven elastomeric composite web may be used such as disclosed in U.S. Patent No. 4,879,170 to Radwanski, et al., and U.S. application Serial No. 07/170,209 to Radwanski, et al., the contents of which are incorporated herein by reference in their entirety.

The basis weight of the nonwoven elastomeric web may illustratively range from 0.20 to 6.0 oz/yd^2. The basis weight is selected to provide desired laminate properties, including recovery and barrier properties. The more preferred basis weight for the nonwoven elastomeric web is from 0.3-3.0 oz/yd^2.

As indicated previously, any suitable method of bonding may be used for joining the webs in forming the laminate materials of the present invention. Bonding may be in discrete points, continuous lines or overall (that is, over 100% of the surface between the textile web and nonwoven elastomeric web). The bonding may be patterned. Thermal self-bonding may be used if the yarns in the textile structure contain thermoplastic fibers that are compatible in adhesion and temperature with the nonwoven thermoplastic elastomeric material. For example, a knit or woven structure containing 30-50% polyester can be sonically or thermally bonded to a web of copolyether ester elastomeric meltblown fibers. In addition, a thermoplastic adhesive may be applied to enhance thermal bonding; fusible coatings, as used to produce fusible interlinings, are illustrative of such thermoplastic adhesives. Alternatively, an adhesive may be pre-applied to the nonwoven elastomeric web and/or to the textile material; such adhesive may be heat activated to achieve lamination. Moreover, aqueous adhesives, or solvent-based additives, known in the art, may be used. An adhesive web can be interposed between textile material and the nonwoven elastomeric web, to

provide the bonding.

An important factor for the adhesive is that it not interfere with the elasticity (e.g., recoverability) of the laminate. Thus, if an adhesive or adhesive web is used to provide bonding over 100% of the area between the textile web and nonwoven elastomeric web, then the adhesive or adhesive web must also be elastomeric.

Illustratively, where thermal bonding is performed to bond the nonwoven elastomeric web and the textile structure, such thermal bonding may be achieved by passing the nonwoven elastomeric web and textile web structure to be laminated through smooth calender rollers, to thermally unite the webs.

As seen in all of the foregoing, various conventional techniques for affixing the textile web and nonwoven elastomeric web to each other can be utilized in the present invention. The main criteria is that a laminate be formed wherein elasticity of the nonwoven elastomeric web is assured, so as to ensure the necessary stretch recovery characteristics of the present invention. Of course, the lamination process must provide a bonding that will withstand the intended end use of the material.

Illustratively, the bonding temperature can range from ambient temperature to 500° F., the optimum temperature range being dependent on the webs used, and adhesive used. Using liquid adhesives could allow ambient bonding temperatures. Elevated bonding temperatures are needed to fuse the webs together using a thermoplastic adhesive web, with actual temperatures being dependent on the adhesive used and the melting temperatures of the involved webs.

The bonding can be performed in a continuous manner, with bonding accomplished between a pair of bonding rolls. Illustratively, when bonding between bonding rolls, the webs to be laminated can be passed between the rolls at a speed of from 2 feet per minute to 1,000 feet per minute. Actual web speed limits are determined by the adhesive system used, as well as the temperature during the bonding and pressure applied by the rolls during bonding. Increasing the web speed decreases the dwell time while bonding; accordingly, additional heat and/or pressure is required at elevated line speeds. The bonding pressure can range from 1-60 PSI in two 4-inch diaphragms applying pressure onto a 14-inch wide roll that is 7-inches in diameter (as one of the two bonding rolls).

Diaphragm pressure is a measure of the bonding pressure, as seen in the following. Thus, diaphragms are provided on either side of one of the two bonding rolls. Pressure applied to the diaphragm is applied to the bonding roll, such that pressure is applied to the webs between the rolls.

In the following paragraphs, various lamination processes according to the present invention will be discussed, with respect to the Figures. As can be appreciated, the disclosed processes are merely illustrative of the present invention, and are not limiting.

Fig. 1 shows a process for forming a two-web laminate according to the present invention. A textile web (e.g., a web of knit or of woven or of scrim material) 1 and a nonwoven elastomeric web 2 are fed between bonding rolls 4, 5 using an unwind device to control the web tension and draw ratio, as known in the art. As the two webs pass through the bonding rolls they are subjected to heat and pressure as follows:

Textile side roll:	214° F (100° F = 37.78° C)
Elastomeric side roll:	109° F (100° F = 37.78 ° C)
Web speed:	10 feet per minute (1fpm = 0.305 m per min.)
Diaphragm pressure:	40 pounds per inch^2 (1psi = 0.069bar)

The two webs are bonded to each other as they pass through the bonding rolls, thereby forming a laminate. The web 6 coming out of the bonding rolls is transferred to a take-up roll 3 that winds the laminate material with the desired web tension and draw ratio.

Fig. 2 shows a first embodiment of forming a three-web laminate. In Fig. 2, webs 7, 8 and 9 respectively are unrolled and positioned adjacent each other, and the combination of webs 7-9 pass between the bonding rolls 10 and 11. In a first illustration, the rolls 7 and 9 are textile material webs, positioned on either side of a nonwoven elastomeric web 8. In this first illustration, the textile webs would be bonded to the nonwoven elastomeric web by, e.g., thermal bonding between bonding rolls 10 and 11, forming the three-web laminate 12. In this first illustration of the second embodiment, wherein the textile webs are placed on either side of a nonwoven elastomeric web, the nonwoven elastomeric web would be buried in the three-web laminate 12.

As an alternative, the outer webs (that is, webs 7 and 9) could be nonwoven elastomeric webs, with the central web 8 a textile web, whereby in the final product the elastomeric webs would be sandwiching a textile web.

As a further alternative, the middle web (represented by the reference character 8 in Fig. 2) could be an adhesive nonwoven web, with the webs 7 and 9 respectively being a nonwoven elastomeric web and a textile web. In this alternative, the adhesive nonwoven web would act to bond the nonwoven elastomeric web and textile web to each other. This alternative was used to produce the three-web laminates of

Examples 1-3 utilizing the general procedures and the processing parameters described in the foregoing paragraphs.

Fig. 3 shows a second embodiment of forming a three-web laminate according to the present invention, using an adhesive to provide the bonding for the lamination. In particular, reference characters 14-16 represent three webs to be laminated. Both of webs 14 and 16 are either a textile web or nonwoven elastomeric web, while web 15 is the other of the textile or nonwoven elastomeric web. Reference character 17 represents an adhesive applicator, known in the art, which deposits an adhesive on both the top and bottom surfaces of the middle web 15. After the adhesive has been applied, web 15 is combined with webs 14 and 16 and passed between the bonding rolls 18 and 19, where bonding occurs. The adhesive used can be any suitable adhesive (liquid or thermoplastic), and can include aqueous or solvent based adhesives, as well as fusible coatings. The adhesive can be applied overall or in a pattern.

Fig. 4 schematically illustrates formation of a five-web laminate. Of the initial webs, both of webs 22 and 26 are either textile webs or nonwoven elastomeric webs, while web 24 is the other of the textile web or nonwoven elastomeric web not used for webs 22 and 26. Webs 23 and 25 are nonwoven adhesive webs. In operation, the webs are unwound to be adjacent to each other and passed through bonding rolls 27 and 28, where the webs are bounded together, forming the laminate material 29. Such laminate material 29 is wound on the take-up roll 30.

As can be seen in the foregoing, any number of webs can be laminated, to form a laminate material according to the present invention, and either the textile web or the nonwoven elastomeric web, or both, can be exposed in the laminate product.

As indicated previously, the laminate material of the present invention has various textile applications. Illustratively (and not limiting), the laminate material can be used to form fitted pads, such as mattress pads and table pads; upholstery, particularly form-fitting upholstery for articles of furniture (chairs, etc.) and slipcovers, as well as covers for walls and partition panels; and wearing apparel. All of these products take advantage of the recovery characteristics of the laminates according to the present invention.

In particular, the laminate web according to the present invention has particular applicability where the nonwoven elastomeric web is formed of meltblown elastomeric fibers. In using meltblown elastomeric webs, for the products as discussed above, the breathable barrier of the meltblown elastomeric component can be effectively utilized.

The following advantages are achieved using the laminate material of the present invention for the products as discussed in the foregoing. Thus, using the laminate material for fitted pads and upholstery, the mattress, chair, etc., can be protected from dirt filtration, while such laminate material has breathability to prevent destructive condensation beneath the cover. Moreover, the covered item can be hidden, utilizing the opacity of the present laminate material.

Moreover, a two-web laminate in fitted covers and upholstery, with the nonwoven elastomeric web (e.g., elastomeric meltblown) against the article covered, provides an anti-slip cover based on the inherently high coefficient of friction of the nonwoven elastomeric.

When the laminate material according to the present invention is used in wearing apparel, the apparel has thermal insulation and a dirt barrier to protect the wearer, while having breathability for comfort. Moreover, wearing apparel made of the laminate material of the present invention has opacity not otherwise achievable in lightweight knits. In addition, a two-web laminate according to the present invention, used as wearing apparel, with the nonwoven elastomeric web next to the skin, can provide a soft suede-like feel for comfort.

In the following are specific examples of laminate materials according to the present invention. Also set forth, for each of these examples, are various properties of the laminate materials. For the various properties of the sample materials, the following test methods were utilized:
Basis weight - FTMS-191A Method 5041
Grab tensile - FTMS-191A Method 5100
Trap tear - FTMS-191A Method 3136
Mullen Burst-FTMS-191A Method 5122

Opacity was determined on a Hunter Color Difference Meter model D25-9 colorimeter and a standard CIE source C (simulated overcast sky daylight) using the contrast-ratio method. The contrast ratio is determined by measuring the reflectance of a fabric when combined with a white standard instrument calibrating tile (available from Hunter Associates Laboratory, Reston, Virginia) and then measuring the reflectance of the same fabric when combined with a black standard instrument calibrating tile. The ratio between the measured reflectances is expressed as the contrast ratio.

Bulk is determined using an Ames thickness tester model 3223 with a 5-inch * foot. Thickness was measured at a pressure of 182 5 grams.

A typical grab tensile cycle test procedure is set forth in the following. The samples were cycled on an Instrom M model 1122 Universal Testing Instrument (constant rate of extension tester) with Microcon II-50KG load cell. Chart and cross head speeds were set for 20 inches per minute and the unit was zeroed, balanced and calibrated according to the standard procedure. The positive stop for a sample is determined using a graph of stress versus strain measured for that sample using FTMS-191A method 500. The positive stop is defined as the point of intersection between a line tangent to the initial portion of the stress-strain curve near the origin and a line tangent to the least slope of the stress-strain curve. The maximum elongation limit for the cycle length was set at a distance determined to be the measured Peak Elongation or Positive Stop from the grab tensile tests. The samples were cycled to the specified cycle length four times, and on the fifth cycle, the sample was taken to the maximum elongation and held for 1 minute. The peak load was measured on the fifth cycle after being held at maximum elongation for one minute. The set is defined as a ratio of the increase in length of the sample after a cycle divided by the maximum stretch during cycling. Permanent set is expressed as a percentage, that is, [(final sample length minus initial sample length)/(maximum stretch during cycling minus initial sample length)] x 100. Permanent set is related to recovery by the expression [permanent set = 100% minus recovery] when recovery is expressed as a percentage.

EXAMPLE 1

A rib knit laminated to a nonwoven elastomeric Arnitel® web, forming a laminate according to the present invention, was provided. The laminate using a nonwoven adhesive web torn provide the bonding between webs. Specifics of the webs are as follows,

Rib Knit:
Yarns - Continuous filament textured polyester
Structure - 22 loops per inch
Basis weight - 1.5 ounces per square yard *
Nonwoven Adhesive Web:
Nonwoven type - Meltblown
Polymer - Elvax® (by E. I. DuPont De Nemours & Co.), an ethylene vinyl acetate
Basis weight - 0.6 ounces per square yard
Nonwoven Elastomeric Web:
Nonwoven type - Meltblown
Polymer - Arnitel® EM 400, (by Akzo Plastics of Arnhem, Holland), a copolyether ester
Basis weight - 0.95 ounces per square yard

The laminate material had properties as set forth in the following Table 1.

* 1 inch = 2.54 cm

* 1oz/yd^2 = 33.91g/m^2

TABLE 1

TEST	KNIT	ADH WEB	EL WEB	SUM OR WEIGHTED TOTAL	CAL. TOTAL	LAM. TOTAL
Code:	6.0	4.0	1.0	Sum	13.0	13.0
Basis Weight (OSY)	1.5	0.6	1.0	Sum	3.1	3.4
1-cycle CD Peak Load (LBS)	0.2	0.3	2.6	Sum	3.1	5.6
5-cycle CD Peak Load (LBS)	0.2	0.3	2.3	Sum	2.9	3.4
5-cycle CD % Set	4.4	38.0	173.0			52.0
Grab Tensile MD Peak Elong. (INS)	1.0	5.4	10.6			1.8
Grab Tensile CD Peak Elong. (INS)	9.0	4.6	12.3			11.2
Trap Tear MD (LBS)	43.4	0.4	0.1	Sum	43.9	23.4
Trap Tear CD (LBS)	1.8	0.1	1.4	Sum	3.3	22.4
Mullen Burst (LBS)	85.6	10.0	10.7	Sum	106.3	93.0
Opacity %	27.8	16.1	44.5			62.1
Bulk	0.02	0.01	0.01			0.03

EXAMPLE 2

A tricot knit laminated to a nonwoven elastomeric Estane® web, forming a laminate according to the present invention, was provided. The laminate used a nonwoven adhesive web to provide the bonding between webs. Specifics of the webs are as follows:

Tricot Knit:

Yarns -- continuous filament Nylon

Structure -- 18 loops per inch

Basis Weight -- 0.6 ounces per square yard

Nonwoven Adhesive Web:

Nonwoven type -- Meltblown

Polymer -- Elvax® (by E.I. DuPont De Nemours & Co.), an ethylene vinyl acetate
Basis weight -- 0.6 ounces per square yard
Nonwoven Elastomeric Web:
Nonwoven type -- Meltblown
Polymer -- Estane® 58887 (by B.F. Goodrich & Co.), a copolymer Urethane
Basis Weight -- 1.4 ounces per square yard

Properties of the laminate material of Example 2 are shown in Table 2.

TABLE 2

TEST	KNIT	ADH WEB	EL WEB	SUM OR WEIGHTED TOTAL	CAL. TOTAL	LAM. TOTAL
Code:	3.0	4.0	3.0	. Sum	10.0	10.0
Basis Weight (OSY)	0.6	0.6	1.4	Sum	2.6	2.6
1-cycle CD Peak Load (LBS)	0.8	0.3	1.7	Sum	2.8	3.3
5-cycle CD Peak Load (LBS)	0.5	0.3	1.4	Sum	2.2	3.4
5-cycle CD % Set	21.5	38.0	14.5			10.5
Grab Tensile MD Peak Elong. (INS)	1.1	5.4	6.0			1.1
Grab Tensile CD Peak Elong. (INS)	3.3	4.6	4.3			3.4
Trap Tear MD (LBS)	8.5	0.4	0.8	Sum	9.7	8.4
Trap Tear CD (LBS)	5.5	0.1	1.5	Sum	7.1	7.6
Mullen Burst (LBS)	42.3	10.0	11.3	Sum	63.6	47.2
Opacity %	12.7	16.1	51.0			55.6
Bulk	.01	.01	.01			0.03

EXAMPLE 3

A woven laminated to a nonwoven elastomeric Arnitel® web, forming a laminate according to the present invention, was provided. The laminate used a nonwoven adhesive web to provide the bonding between webs. Specifics of the webs are as follows:

Woven:

Yarns -- Spun staple yarns, 50% polyester and 50% cotton

Structure -- Plain weave, 32 x 32 yarns per inch

Basis weight -- 2.4 ounces per square yard

Nonwoven Adhesive Web:

Nonwoven type -- meltblown

Polymer -- Elvax® (by E.I. DuPont De Nemours & Co.), an ethylene vinyl acetate

Basis weight -- 0.6 ounces per square yard

Nonwoven Elastomeric Web:

Nonwoven type -- Meltblown

Polymer -- Arnitel® EM 400 (by Akzo Plastics of Amhem, Holland), a copolyether ester

Basis weight -- 0.95 ounces per square yard

Properties of the laminated material of Example 3 are shown in Table 3.

TABLE 3

TEST	WOVEN	ADH WEB	EL WEB	SUM OR WEIGHTED TOTAL	CAL. TOTAL	LAM. TOTAL
Code:	8.0	4.0	1.0		14.0	14.0
Basis Might (OSY)	2.4	0.6	1.0	Sum	4.0	4.0
1-cycle bias CD Peak Load (LBS)	0.8	0.3	2.6	Sum	3.7	3.8
5-cycle bias CD Peak Load (LBS)	0.6	0.3	2.3	Sum	3.2	3.5
5-cycle bias CD % Set	3.8	38.0	173.0	Sum		3.5
Grab Tensile MD Peak Elong. (INS)	1.4	5.4	10.6			NA
Grab Tensile CD Peak Elong. (INS)	1.3	4.6	12.3			2.0
Trap Tear MD (LBS)	38.3	0.4	0.1	Sum	38.8	32.2
Trap Tear CD (LBS)	38.8	0.1	1.4	Sum	39.6	75.4
Mullen Burst (LBS)	181.6	10.0	10.7	Sum	202.3	191.2
Opacity %	34.5	16.1	51.0			67.1
Bulk	.02	.01	.01			0.02

As seen in the foregoing examples, the laminate material of the present invention, including the nonwoven elastomeric web, provides improved properties as compared with the textile material itself.

Thus, the laminate material of the present invention, including the nonwoven elastomeric web and the textile web, achieves the advantages of the textile web, while also achieving improved properties, such as opacity, due to the nonwoven elastomeric web. Moreover, the laminate materials of the foregoing Examples have the following further improvements in tensile properties:

(1) The laminate material is stronger than the sum of the components using the Grab Tensile Peak Load Test;

(2) The overall cross-direction elongation of the laminate material was improved without effecting machine direction elongation; and

(3) The laminate material changed direction of tear strength, the individual components having a machine direction tear strength greater than that of the cross-direction, while the laminate material had a stronger

cross-direction tear strength than that in the machine direction.

The laminate according to the present invention has improved breathability, as compared to textile laminates including an elastic film. Moreover, the laminate according to the present invention, including the elastomeric nonwoven web, imparts snag resistance to knits that would otherwise be prone to snagging. Moreover, the laminates according to the present invention can be produced in lower basis weights than wovens or knits that contain elastic yarns, due to the denier of elastic yarns. Furthermore, the laminates according to the present invention can be produced at a lower cost than wovens or knits that contain elastic yarns, due to the processing difficulties of elastic yarns. Moreover, the laminates of the present invention, having an exposed elastomeric web, achieve an anti-skid surface. Moreover, the laminate processing according to the present invention provides techniques for adding elasticity to available textiles, efficiently and at a relatively low cost.

Moreover, the laminates of the present invention have a desirable power stretch recovery. That is, the laminates of textiles and nonwoven elastomeric webs have a retraction force that is more desirable than the retraction force of textiles which do not contain elastic yarns, threads rubberized film backings or coatings. One useful gauge of this retraction force is the peak load measured after a material sample has been cycled several times to its maximum elongation and then held at that maximum elongation for about one minute. Materials with a particularly useful retraction force will have a higher measured peak load after such cycle testing than materials with a poor retraction force.

As can be seen from the results of the grab tensile cycle tests reported in Tables 1-3 and, in particular, the measured 5-cycle bias Peak Load, textile materials such as, for example, rib knits, tricot knits, and plain weave materials have a low retraction force (i.e., a low measured 5-cycle bias Peak Load) when compared to the laminates of the present invention.

Claims

1. A laminate material having stretchability and recovery, comprising a first web (1) of a material selected from the group consisting of a woven material, a knit material and a scrim material, joined to a nonwoven elastomeric web (2) the laminate material being free of an elastomeric film, said first web being substantially flat when the nonwoven web is unstretched, the nonwoven elastomeric web providing recovery to the laminate.

2. A laminate material according to claim 1, wherein the nonwoven elastomeric web (2) is a web of meltblown elastomeric fibers.

3. A laminate material according to claim 1 or 2, wherein the first web (1) is made of a knit material.

4. A laminate material according to claim 3, wherein the knit material is stretchable but has substantially no recovery, the web (2) of meltblown elastomeric fibers providing recovery for the laminate material.

5. A laminate material according to one of claims 2 to 4, wherein the web of meltblown elastomeric fibers is a web of meltblown fibers made of a material selected from the group consisting of elastic copolyetherester, elastic urethane polymer, a copolymer of ethylene and at least one vinyl monomer, block copolymers having two blocks, which alternate with each other, and/or A-B-A' block copolymers, where A and A' may be the same or different end blocks and each in a thermoplastic polymer which contains a styrenic moiety, and B in an elastomeric polymer midblock,

6. A laminate material according to one of the preceding claims, wherein the nonwoven elastomeric web (2) has omni-directional stretch and recovery.

7. A laminate material according to one of claims 2 to 6, wherein the meltblown elastomeric fibers range from 0.5 to 100 μm in diameter, preferably to from 0.3 to 20 μm in diameter.

8. A laminate material according to one of the preceding claims, wherein the nonwoven elastomeric web (2) has a basis weight of 0.20 to 6.0 oz/yd^2 *.

9. A laminate material according to one of claims 2 to 8, wherein the first web is made of a knit material,

* 1 oz/yd^2 = 33.91 g/m^2

and the nonwoven elastomeric web has a basis weight of 0.30 to 3.0 oz/yd^2.

10. A laminate material according to one of the preceding claims, wherein the nonwoven elastomeric web (2) is a composite web.

11. A laminate material of one of claims 2 to 10, wherein the web (2) of meltblown elastomeric fibers is a composite web mode of [1] a mixture of two or more different fibers or [2] a mixture of fibers and particulate materials, with at least one of the fibers being elastomeric meltblown fibers.

12. A laminate material according to one of the preceding claims, wherein the laminate material further includes an adhesive web between the first web (1) and nonwoven elastomeric web (2) to join the first web and nonwoven elastomeric web by bonding.

13. A laminate material according to claim 12, wherein the adhesive web is a thermoplastic elastomeric web.

14. A laminate material according to one of claims 1 to 10, wherein the first web (1) and nonwoven elastomeric web (2) are joined by being self-bonded to each other, to provide the laminate material (6).

15. A laminate material according to claim 14, wherein the first web (1) and nonwoven elastomeric web (2) are thermally bonded to each other.

16. A laminate material according to one of the preceding claims, wherein the laminate material includes, in addition to the first web and the nonwoven elastomeric web, a second web of a material selected from the group consisting of a woven material, a knit material and a scrim material, the nonwoven elastomeric web being sandwiched between the first and second webs.

17. A laminate material according to one of the preceding claims, wherein the laminate material includes at least one further web, of a material selected from the group consisting of a woven material, a knit material and a scrim material, the nonwoven elastomeric web being buried among the first web and the at least one further web.

18. A laminate material according to one of claims 1 to 16, wherein the nonwoven elastomeric web is exposed in the laminate material.

19. A laminate material according to claim 1, wherein the first web is made of a knit material, and the nonwoven elastomeric web is made of a material selected from the group consisting of elastic copolyetherester, elastic urethane polymer, a copolymer of ethylene and at least one vinyl monomer, block copolymers having two blocks, which alternate with each other, and/or A-B-A' block copolymers, where A and A' may be the same or different end blocks and each is a thermoplastic polymer which contains a styrenic moiety, and B is an elastomeric polymer midblock.

20. A laminate material according to one of the preceding claims, wherein the laminate material is a fitted pad, preferably a mattress pad or a table pad.

21. A laminate material according to claim 20, wherein the fitted pad is adapted to be placed on an article, with the nonwoven elastomeric web adjacent the article.

22. A laminate material according to one of claims 1 to 19, wherein the laminate material is upholstery.

23. A laminate material according to claim 22, wherein the nonwoven elastomeric web of the upholstery is adjacent an article covered by the upholstery.

24. A laminate material according to claims 22 or 23, wherein the upholstery is a slip cover.

25. A laminate material according to one of claims 1 to 20, wherein the laminate material is a cover for a wall or partition panel, or wherein the laminate material is wearing apparel in which preferably the nonwoven elastomeric web of the laminate material is adapted to be adjacent the skin of the wearer of

the wearing apparel.

26. A laminate material according to claim 25, wherein the first web is made of a knit material.

27. A process for forming a laminate material especially according to one of the preceding claims, having stetch and recovery, and having a flat surface when the laminate material is in the unstretched state, the laminate material being free of an elastomeric film, comprising the steps of:

    providing a first web of a material selected from the group consisting of a knit material, a woven material and a scrim material, proximate to a nonwoven elastomeric web, and

    joining the first web to the nonwoven elastomeric web such that, when the joined first web and nonwoven elastomeric web are not stretched, the first web is substantially flat, the bonding being performed without an elastomeric film such that the laminated material is free of an elastomeric film.

28. The process according to claim 27, wherein the nonwoven elastomeric web is a web of meltblown elastomeric fibers.

29. The process according to claim 28, wherein the meltblown elastomeric fibers are made of a material selected from the group consisting of elastic copolyetherester, elastic urethane polymer, a copolymer of ethylene and at least one vinyl monomer, block copolymers having two blocks, which alternate with each other, and/or A-B-A' block copolymers, where A and A' may be the same or different end blocks and each is a thermoplastic polymer which contains a styrenic moiety, and B is an elastomeric polymer midblock.

30. The process according to claim 28 or 29, wherein the first web is made of a knit material.

31. The process according to one of claims 28 to 30, wherein the web of meltblown elastomeric fibers is a composite web made of [1] a mixture of two or more different fibers or [2] a mixture of fibers and particulate materials, with at least one of the fibers being elastomeric meltblown fibers.

32. The process according to one of claims 27 to 31 wherein the nonwoven elastomeric web is a composite web.

33. The process according to one of claims 27 to 32, wherein the nonwoven elastomeric web is made of a material selected from the group consisting of elastic copolyetherester, elastic urethane polymer, a copolymer of ethylene and at least one vinyl monomer, block copolymers having two blocks, which alternate with each other, and/or A-B-A' block copolymers, where A and A' may be the same or different end blocks and each is a thermoplastic polymer which contains a styronic moiety, and B is an elastomeric polymer midblock.

34. The process according to one of claims 27 to 33, wherein the nonwoven elastomeric web is substantially unstretched during said joining.

35. The process according to one of claims 27 to 33, wherein the nonwoven elastomeric web is partially stretched during said joining, the partial stetching not being sufficient to cause gathering of the first web, after joining, upon removal of the partial stretching from the nonwoven elastomeric web.

36. The process according to one of claims 27 to 35, wherein the joining is achieved by thermally bonding the first web and nonwoven elastomeric web.

37. The process according to claim 36, wherein the first web is provided proximate to the nonwoven elastomeric web with a thermoplastic adhesive therebetween, the thermoplastic adhesive enhancing the thermal bonding between the first web and the nonwoven elastomeric web.

38. The process according to one of claims 27 to 35, wherein an adhesive web is provided between the first web and the nonwoven elastomeric web, in the providing step, and wherein the adhesive web bonds the first web to the nonwoven elastomeric web in the joining step.

39. The process according to claim 38 wherein said adhesive web is an elastomeric adhesive web.

40. The process according to one of claims 27 to 39, wherein, in the providing step, at least one further web is provided proximate to at least one of the first web and the nonwoven elastomeric web, and, in the joining step, said at least one further web is joined to the first web and the nonwoven elastomeric web, wherein said at least one further web is selected from the group consisting of a nonwoven elastomeric web, a web of scrim material, a web of woven material and a web of knit material.

41. Use of the laminate material of one of claims 1 to 19 or formed according to one of claims 27 to 40 as a fitted pad, preferably a mattress or table pad, as a material of upholstery, as a slip cover, as a cover for a wall or partition panel, or as wearing apparel.

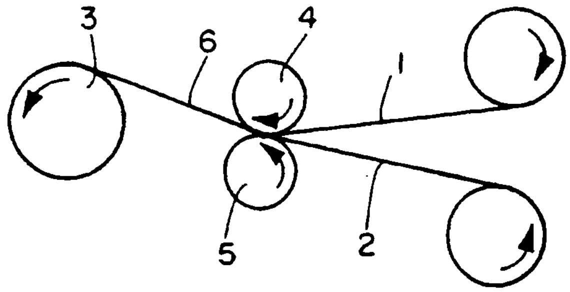

FIG. 1

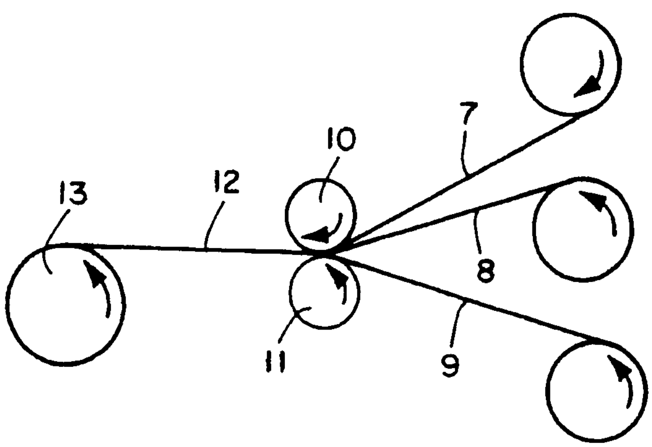

FIG. 2

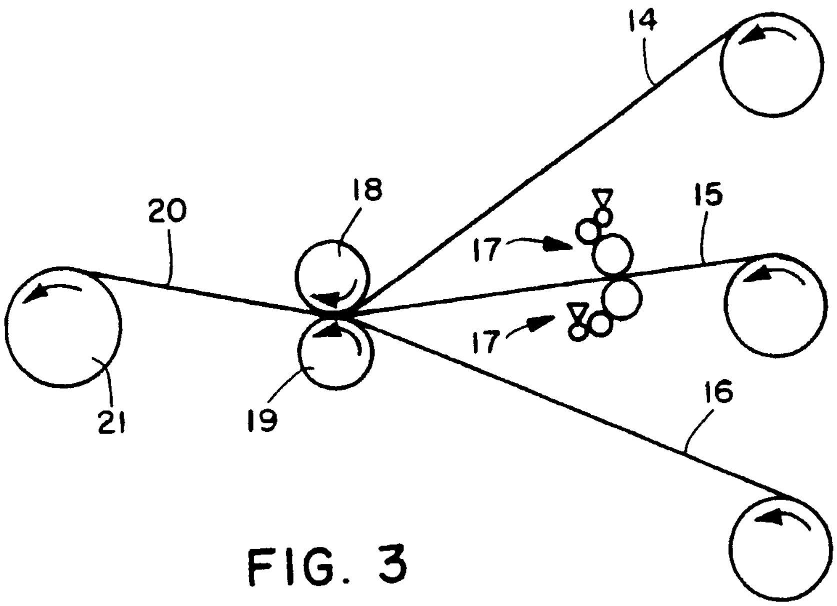

FIG. 3

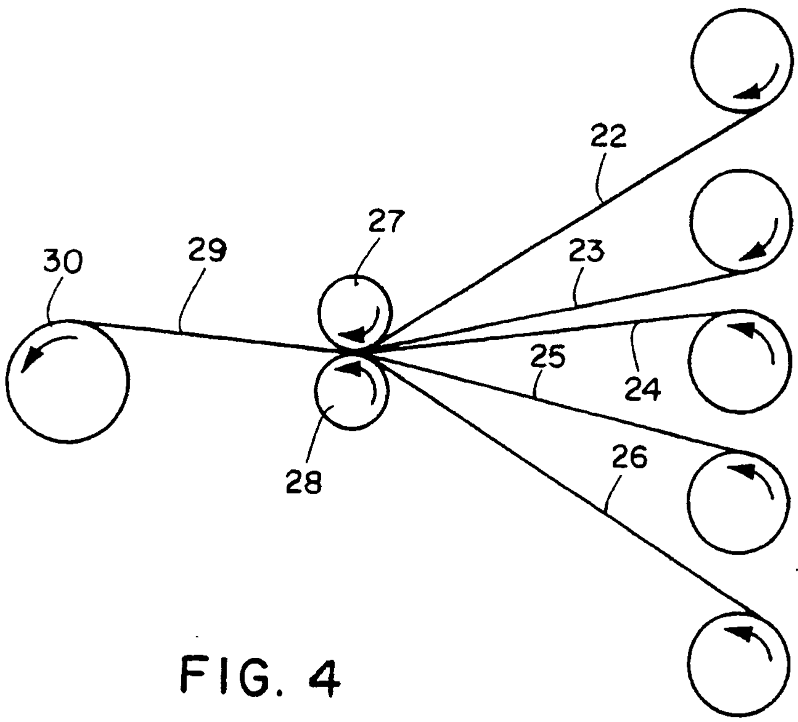

FIG. 4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 10 5036

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X,D	EP-A-0 053 188 (TORAY) * the whole document *	1-4	D 04 H 13/00
Y,D,A	US-A-3 904 455 (DANIEL S. GOLDMAN) * the whole document *	1,3,9, 15-17, 22-24,26, 30,40	
Y	DE-A-3 824 983 (MINNESOTA MINING) * page 2-3; claims 1-15 *	1	
A	EP-A-0 239 080 (KIMBERLY-CLARK) * claims 1-7, 19-23 *	2,4-5,7, 10,19,29, 33	
A	US-A-4 522 863 (DANIEL H. KECK) * claims 1, 7 *	27,28, 36-40	
A,D	EP-A-0 217 032 (KIMBERLY-CLARK)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

D 04 H

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	08 July 91	DURAND F.C.

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
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